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24 April 1984

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

FOREIGN BROADCAST INFORMATION SERVICE

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

BRITAIN'S ICI DEVELOPS NEW EASY-TO-SHAPE COMPOSITES

Paris L'USINE NOUVELLE in French 2 Feb 84 pp 59-60

[Article by Pierre Laperrousaz: "APC-1: Composites That Are Easy to Use"]

[Text] These preimpregnated thermoplastic products are preheated at 300-400°C, then pressed into a cold mold. As only pressure and heat are used, the fabrication cycle of these new composites lasts only 2 minutes.

The English chemical company ICI [Imperial Chemical Industries] is trying to gain a monopoly on thermosetting resins for high-performance composites. Its battle horse is a thermoplastic, polyetherethercetone or PEEK that was developed two years ago in the company laboratories; it is characterized by its remarkable heat resistance (it melts at 340°C). ICI imagined to reinforced PEEK with continuous carbon fibers and is now offering a whole range of preimpregnated thermoplastic intermediate products: unidirectional ribbons and sheets to make laminated products, filaments for coils, and prelaminated panels up to 25 mm thick for press forming. The filler content is 54 percent by volume, and 62 percent by weight.

These new composites are called APC-1 (Aromatic Polymer Composites) and are distinct from traditional thermosetting matrix composites essentially in the way they are used. Only pressure and heat are required; no chemical reactions are involved. Concepts like "curing time" or "pot life" or "seasoning" are no longer used. The starting product (sheets, ribbons, etc.) are merely preheated to the softening temperature (300-400°C), then pressed into a cold mold. There is no need for an autoclave. The pressure required ranges from 5 bars for compressed-air diaphragm forming to 10 bars for punch-and-die forming and 60 bars for hydroforming (with a hydraulic diaphramg). According to Martin Swerdlow, who is in charge of new materials development at ICI, "the entire fabrication cycle--heating, forming, cooling--takes about 2 minutes." Compared with that, the transformation of thermosetting preimpregnated materials takes several hours.

For more difficult molding operations requiring superior draping ability, ICI has developed a "nearly isotropic" laminated product obtained by braiding unidirectional ribbons (for the moment, no preimpregnated fabrics are available). The aluminum tools used are relatively cheap. Wood has even been used for simple geometries and molding pressures not exceeding 7-15 bars.

A West German firm is considering producing filament coils from 3-mm wide preimpregnated ribbon. The APC-1 can also be formed by techniques similar to those used in metallurgy, such as rolling, to manufacture shapes (rate: 10 m/mn). The products are easily drilled, tapped, sawn, etc., using tools commonly used with aluminum, and scraps can be recycled as granules for injection molding. Finally, the material can also be glued; the adhesive used can be a strip or ribbon that is heated, if need be, by taking advantage of the electric conductivity of carbon fibers.

The mechanical properties of the product--breaking strength of 167 MPA [mean atmospheric pressure] for a modulus of 120,000 MPA in the direction of the filler--are very close to those of an epoxy-carbon fiber composite (with a 60 percent filler content by volume). And many of these characteristics are retained beyond the matrix vitreous transition point (140°C). Thus, at 150°C, the composite retains 95 percent of its rigidity at 23°C and over 50 percent of its breaking strength (and respectively 100 and 90 percent at 100°C). ICI is also stressing other characteristics: improved impact and fatigue strengths compared with epoxy composites, improved resistance in hot and damp environments, due to the low water absorption rate of the product, good resistance to solvents and oil products, V-0 resistance to fire for thicknesses of 1.5 mm, according to U.S. standards, etc.

The introduction of this new composite coincides with ICI's confirmation of its intention to build a 100-200 t/year PEEK production unit near Wilmington in the United States, implying that the British company is expecting to find an open market. The non-reinforced polymer (or reinforced with cut fibers) has already found a number of applications for mechanical parts. The APC-1 has been well received in the aeronautics industry, according to Martin Swerdlow. However, he pointed out, it cannot be expected to replace epoxy composites in all cases. The product will be used preferentially for parts subjected to severe fatigue, creep and delamination conditions.

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CSO: 3698/337

SWEDISH ACTIVITIES IN NEW CERAMIC MATERIALS, PROCESSES

Stockholm KEMISK TIDSKRIFT in Swedish Jan 84 pp 37, 38, 40, 42

[Article by Associate Professor Leif Hermansson and Roger Carlsson, M. Tech., Swedish Silicate Research Institute, Goteborg; numbers in parentheses refer to bibliography]

[Excerpt] Swedish Development

The development of ceramic construction materials is being carried out by only two Swedish firms today, namely ASEA, Inc. [General Electric Company, Inc.] and Sandvik, Inc. The supplier of raw materials for this kind of material is Kema-Nord, Inc., Ljungaverk (silicon and silicon nitride powder). University and technical college development is concentrated primarily at Chalmers Technical College and the Swedish Silicate Research Institute.

The development of silicon nitride material occurs at ASEA, Inc. according to the so-called HIP (Hot Isostatic Pressing) method in which ceramic powder is compacted under great pressure at high temperatures. During the process the shaped body is coated by a glass layer subject to very high argon pressure. The method has aroused great interest in the ceramic world.

Sandvik, Inc. is developing a so-called SiAlON material. In principle SiAlON is a silicon nitride alloy. The material is excellent for cutting processes.

The development work at the Silicate Research Institute is relatively broad with all process stages being studied, i.e. preparation of raw materials, shaping, elimination of the bonding phase, vitrification and evaluation of properties, to some extent. Some of the materials studied are silicon carbide, silicon nitride and zirconium dioxide.

The development of ceramic construction materials involves extending practically all the process parameters compared with traditional ceramic production. It calls for very fine-grained and extremely pure raw materials as well as very high vitrification temperatures.

Some stages of the process must be carried out in pure-air chambers to insure against environmental pollution. Very small defects (less than 10 microns) can affect the strength of ceramics, compared to metals where the critical defect level is at least 10 times larger.

The "High-Temperature Ceramics for Fuel Engines" project at the Silicate Research Institute is run by a project committee with members from the engineering, automobile and ceramics industries in this country. During the project period, several separate projects or related projects have been initiated by the institute (see figure below).

Two new techniques will be briefly described here in relation to important partial results from the high-temperature project. One involves sintering (densification as a result of firing) of silicon nitride and the other a new way of expelling organic binding agents from an injection-molded detail.

Multitude of Sintering Techniques

At least ten different sintering methods are cited in the literature. The Silicate Research Institute's method is called NPS, which stands for Nitrided Pressureless Sintering. This involves a combination of nitrided silicon and so-called pressureless sintering.

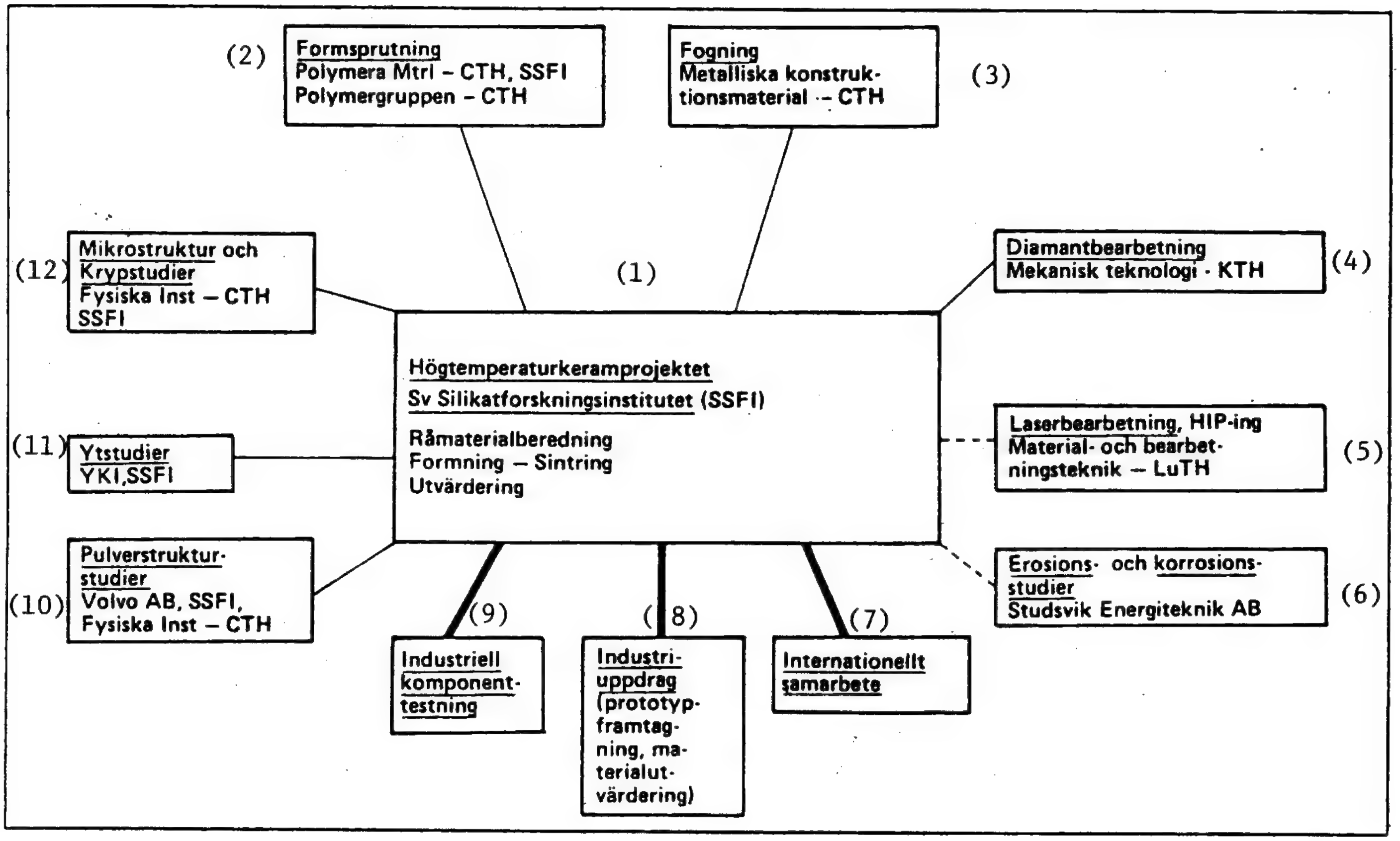
The concept of pressureless sintering is generally used to stress the possibilities of obtaining advanced materials without applying pressure in the sintering process. In this method the silicon is milled together with the sintering agent in a matrix of silicon nitride. A ceramic body is formed with the powder mixture, after which the silicon is nitrided, forming silicon nitride. This nitride process takes place at a temperature of 1300-1400°C. In this step, a large part of the pore system is filled in while the surface geometry of the ceramic body is retained.

In the final sintering, which takes place at 1800°C., the material is completely densified. Thanks to the nitride step (where the pores are filled in), this can be done with a linear shrinkage of only 8-9 percent. Normal firing shrinkage is around 15-20 percent. The material can be processed after the nitride step.

Earlier, Ford and Fiat presented an SRBSN (Sintered Reaction Bonded Silicon Nitride) method based on silicon and a sintering agent. In this process, however, the nitride step is very slow--several days, compared to a few hours for the NPS technique (3).

Polymer and Surface Chemistry

Construction ceramics can be shaped according to several different methods. Slip casting and injection molding are among the most interesting of these methods (4, 5).



Activities in the Construction Ceramics Sector Related to the Swedish Silicate Research Institute (SSFI).

Key:

1. High-Temperature Ceramics Project: Swedish Silicate Research Institute. Raw materials preparation, forming, sintering, evaluation.

2. Injection molding. Polymer materials: SSFI, CTH [Chalmers Technical College], polymer group: CTH.

3. Adhesion. Metallic construction materials: CTH.

4. Diamond processing. Mechanical technology: KTH [expansion unknown].

5. Laser, HIP processes. Material and processing technology: LuTH [expansion unknown].

[Key continued on following page]

6. Erosion and corrosion studies: Studsvik Energy Technology, Inc.

7. International cooperation.

8. Industrial tasks (prototype production, evaluation of materials).

9. Industrial components testing.

10. Powder structure studies: Volvo, Inc., SSFI, Physics Institute, CTH.

11. Surface studies: YKI [expansion unknown], SSFI.

12. Microstructure and shrinkage studies: Physics Institute, CTH, SSFI.

In processes where powder exists in a suspension (for example, painting, classing, sedimentation, mixing operations and slip casting), knowledge about the surface condition of the particles in the suspension is extremely important. Sedimentation and flocculation (agglomerate formation) are key elements in the production of high-class ceramics. The Silicate Research Institute and the Surface Chemistry Institute, among others, have worked together in this area.

In the injection molding technique, where a large quantity of ceramic powder in a plastic matrix is injected (formed) in a device, the most critical element is the removal of the organic binding agent. The volume ratio of the binding agent, 30-40 percent, must be removed without causing defects.

Defects introduced early in the process cycle appear in the final product, which results in poor durability (6). Because of its elastic nature, ceramic material is more intolerant of defects than construction materials that can be distorted plastically.

The institute has developed a new technique precisely to burn plastic out of injection-molded parts. The method is called RCE, which stands for Rate Controlled Extraction. In the process the component is placed in a kiln. The weight of the components and thus of the organic binding agents as well are registered continuously.

Information on the time, temperature and weight is processed continuously by a microcomputer to control the speed with which the binding agent is removed. Throughout the process a rapid but precisely-controlled removal is maintained (4).

More Research--Rapid Production

Through strong STU [Technical Development Board] support, investment in construction ceramics in Sweden has got off to a late but strong start. This

applies to the areas of ceramic process technology, microstructural studies and processing aspects.

Other elements important to the area where little or no development is taking place call for the attention of dedicated Swedish scientists. This is true of adhesion (ceramic ceramics), nondistorting testing (detection of defects that will affect strength), synthesis of raw materials (new tailor-made ideal powders) and design problems (construction with fragile materials, fracture probability problems) and the problem of upgrading.

As a step in this process of building up expertise, an internationally prominent ceramics expert, Dr Fred Lange, Rockwell International Science Center in the United States, was associated with Chalmers Technical College and the Silicate Research Institute in the fall of 1983.

Development of all the elements is critical if Sweden is to meet the great international competition in the area and be prepared for an anticipated breakthrough in the sector of construction ceramics. The new Stone Age is on its way!

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6578
CSO: 3698/332

EEC SETS UP FIVE-YEAR BIOTECHNOLOGY DEVELOPMENT PROGRAM

Stockholm NY TEKNIK in Swedish 12 Jan 84 p 6

[Article by Staffan Dahllof]

[Text] Copenhagen--The EC has decided to catch up with Japan and the United States in the field of biotechnology. The means will be lower prices for raw materials and the joint training of experts.

There is great concern in the EC over the fact that Europe lacks the means of developing its own technology of the future.

The EC countries have already agreed on a research program for information technology known as ESPRIT (European Strategic Program for Research and Development in Information Technology).

Now it is biotechnology's turn.

The European Commission--the EC's highest administrative body--warns that:

The United States allocates twice as much of its research money to biotechnology as the EC's members do of theirs.

The Japanese Government supports biotechnology with 10-year research plans.

As a result, West Europe finds it hard to keep its own experts. Outstanding researchers are attracted to the United States.

The Commission does not believe that the biotechnical industry in the EC will be able to hold its own without help.

Training Contracts

The EC's countermove will therefore be a 5-year program to strengthen joint development by its member countries.

1. The price of sugar and industrial starches will be reduced.

2. The "most outstanding experts" in the EC will be offered training contracts and stipends to promote interprofessional know-how.

3. The pharmaceutical industry will be urged to concentrate on drugs for preventive medicine.

The EC's weakness in comparison with the United States and Japan is due to the fact that it is divided into several nations.

Joint Approach

The European Commission therefore wants to set up a joint approach within the EC to such ethical issues as experiments on animals and the coordination of copyright and patent matters.

Otherwise, there is a danger that individual firms will hold back their secrets to the detriment of joint development.

The 5-year biotechnology program will begin in July 1984. The cost is estimated at just over 1 billion Swedish kronor.

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CSO: 3698/328

DEVELOPMENTS WORLDWIDE, COMPETITION WITH FRENCH SURVEYED

Paris L'USINE NOUVELLE in French 23 Feb 84 pp 32-37

/Article by Bertrand Le Balc'h/

/Text/ Biotechnologies are still a drawing card, as shown by the success of the symposium recently organized in Paris by APRIA (Association for Promotion of Industry and Agriculture) on "risk capital and biotechnological innovation in agro-industry." In the hall were nearly 300 participants: academics, scientists, representatives of government and finance, but also many industrialists in various fields including agro-foodstuffs, chemistry, pharmaceuticals, and paper-cardboard products.

Government circles seize every opportunity to reassert the priority status given to biotechnologies. "Priority to the future on the industrial plane. That is the meaning of the choice of biotechnologies as a field in which France should excel," declared Minister of Industry and Research Laurent Fabius to the National Assembly during the debate on French industrial strategy.

New initiatives are in fact underway in that field. Rhone-Poulenc, the number one French firm in bio-industry with 10,000 cubic meters of fermentation capacity and Fr 3 billion of turnover in products of biological origin, is entering the seed industry in association with the American firm Seedtec International of the Kay Corp. petroleum group, which had a $600 million turnover in 1982. The two partners will establish a research firm specializing in sunflower improvement.

Also in the seed field, the National Institute for Agronomic Research (INRA) announces creation of its first affiliate, Agriobtentions. Its mission is to commercialize the plant genetic material perfected by the institute. The Lafarge-Coppee group, for its part, is preparing to invest Fr 250 million to strengthen the positions of its affiliates Orsan (first European producer of sodium glutamate) and Eurolysine (number one European lysine producer) in the animo acids sector.

In the energy field the Association for Development of Fuels by Fermentation (Ascaf), consisting of the French Energy Control Agency (AFME) and the

French Petroleum Institute (IFP), has just now finally decided to launch its pilot project to produce an acetone-butanol mixture (ABE) by means of biotechnology. The method used is enzymatic hydrolysis of lignocellulose substrates such as straw and corncobs. ABE is a "tertiary solvent" indispensable for adding methanol or ethanol to automobile gasoline. An experimental unit, representing an investment of Fr 150 million financed with public-sector assistance, will be set up at Soustons in the Landes. It will be built by Technip, and is planned to enter service in late 1986.

These initiatives--coming after such others as the creation of Transgene, Biosys and Germe, and the entry of the petroleum firm Elf-Aquitaine into the seed sector and of Moet-Hennessy into horticulture--are proof that since publication in late 1979 of famed report "Life Sciences and Society" by MM Gros, Royer, and Jacob, France is in the biotechnological race.

They are essential, but are they enough? Baron Pierre de Coubertin's maxim "the important thing is not to win but to participate," is difficult to apply to industrial jousting. There the stakes are too risky, and particularly so in bio-industries.

More and More Sectors Involved in Biotechnologies

Formerly limited essentially to such food products as wine, beer, and cheese, biotechnologies will henceforth intervene in multiple sectors including pharmaceuticals, chemistry, energy, plastics, and environmental management--in varying degrees, to be sure, and at times to a very small extent. But diffusion of biotechnologies through the industrial fabric is only just beginning.

By way of comparison with electronics, who could have imagined in 1971, when Intel launched its first microprocessor, that the electronics market would experience such an explosion? For bio-industries the forecasts (see graph) indicate a strong growth of the world market. It should at least double in 1980-90 to reach $30 to 40 billion. Some forecasting institutes even advance the figure of $100 billion by 2000. So the stakes are considerable.

But France is not alone in the lists. In this contest it is faced, first of all, by two crack competitors: the United States and Japan.

To begin with the reigning champion, the United States. Its research effort is formidable, its financial market remarkably active, and its industry powerful and dynamic. That mix has enabled the United States to win a predominant place on the world checkerboard of biotechnologies. It is the world's largest producer of antibiotics, vaccines, and diagnostic reagents. "Apart from the Soviet Union, the United States accounts for over 50 percent of world growth in biotechnologies. The rest is divided between Japan, with 15 to 20 percent, and western Europe, with 5 percent for France," considers Biofutur managing director Jean Comar.

The most spectacular aspect of biotechnologies in the United States is the extremely rapid emergence of a new industrial sector based on genetic engineering. By late 1979, according to the F. Eberstadt research institute of New York, there were fewer than 14 American firms working in genetic engineering. Two years later they had increased tenfold, and today there are probably 200, as compared to a mere three in France: Transgene, G3, and Genetica.

The United States: Advantages of a Benevolent Tax Structure

Such expansion is in large part explained by the presence in the United States of an extremely dynamic pool of venture capital benefiting from a liberal tax structure. According to figures presented to the APRIA symposium by Dominique Peninon of the Compagnie Financiere, this method of financing made it possible to mobilize $250 million in 3 years (1980-82) for biotechnological firms. "The key to our success is the same as that used by other American biotechnological companies: the spirit of enterprise shared by scientific leaders, investors, and private industrial groups," fondly repeats Ronald Cape, president of Cetus, a company which with Genentech played a pioneering role in genetic engineering during the 1970's.

In contrast to what is happening in France with the Ministry of Industry's mobilization program, there is no master plan for biotechnologies development in the United States. The public sector does, however, participate very actively in financing research, both public and private. "We did, after all, finance the research which allowed Genentech to perfect its process for making insulin," declared Hermann W. Lewis, head scientist at the National Science Foundation, to BUSINESS WEEK. Total public assistance to research and development reached $3 billion last year, as compared to $120 million in France. All things considered, the gap is still extensive.

Pharmaceuticals, chemistry, and the petroleum industry seem the most active across the Atlantic. From Johnson and Johnson to American Home Products and including Bristol-Myers, Merck and Searle, most major American pharmaceutical groups have set up sizeable biotechnological research teams. Last spring Ely Lilly, with 30,000 employees and a $3 billion turnover, caused a sensation by marketing human insulin, developed by Genentech, the number one Californian firm in genetic engineering. The industrial stake is a $150 million market, already half controlled by the American firm with a conventional insulin hormone extracted from hog and beef pancreas.

Still more ambitious is the wager being made by Schering-Plough. The American firm will build in Ireland a plant to produce Alpha interferon, perfected by Biogen, a genetic engineering firm established in Geneva, whose president is the American Walter Gilbert, winner of the Nobel prize in chemistry. At stake is $100 million, for interferon, basic in anticancer and antiviral treatment, is a very controversial product. But for Schering-Plough, which is undergoing full reorganization and has resold several enterprises in order to buy back the Californian genetic engineering firm Dnax, it is absolutely vital that it find its second wind in biotechnologies.

On the chemical side activity is quite as intense. Thus Dow Chemical participates for 5.5 percent in the capital of Laborative Research (genetic engineering) and has assigned different research programs to that firm. The first result is the announcement of a new method of producing an enzyme for the cheese industry.

This strategy of considering biotechnological research as the pathway to a new diversification is found in application by Dupont de Nemours, the world's number one chemical firm, with 135,000 employees and a $33 billion turnover, and by Monsanto.

For a long time, Dupont de Nemours has had broad ambitions in pharmaceuticals, but despite its acquisition of Endo Laboratories in the 1960's it has not yet achieved a real breakthrough. By forming a biotechnological research team, contracting for outside research, and by participation in New England Nuclear Corp. (genetic engineering), Dupont de Nemours is progressively putting in place the means to realize its ambitions.

That is likewise the case with Monsanto, with 52,000 employees and a $6.3 billion turnover, which draws support from Innoven, its venture capital affiliate. "When we created Innoven in 1972, in association with Emerson Electrics, we were in no way active in biotechnology, and no one in our management in Saint Louis was yet aware of its future importance to the group," explains R. A. Onians, director of development for Monsanto Europe. "Without the data provided by Innoven, which participates in Collagen Corp., Biogen, and Genex, we would not today enjoy as good a position in biotechnology."

Monsanto has shown by its success with plant disease prevention agents, which in less than 10 years has made it the world's number one herbicide producer, that it knows how to conduct a successful diversification program.

Like the chemists, groups in the petroleum industry often seek to break into new fields through biotechnology. Shell Oil, for example, is collaborating with Cetus to perfect a human interferon. But whatever their motives, many of them are "insiders." Thus 8 of the 12 largest American firms, including the world's number one, Exxon, are investing in biotechnology, and 6 of them participate in genetic engineering firms.

Americans and Japanese Multiply Cooperation Agreements

In Japan, venture capital is in its infancy and there are very few genetic engineering firms. But the MITI (Ministry of Industry and International Trade), struck by the American example, has become aware of the importance of venture capital. Financial, regulatory, and stock exchange conditions favorable to its flourishing growth are progressively coming into being. Already their effects are being felt among Japanese, but also foreign, investors. Paribas, for example, last year established a venture capital firm in Japan. Concurrently, MITI in 1980 launched a 10-year program, with funds of 25 billion yen, focused on bioreactors, mass cell culture, and

genetic recombining. The latter will receive 10 billion yen in order to catch up with the United States and certain European countries.

Conscious of their vulnerability in genetic engineering, the Japanese are multiplying cooperation agreements with American firms, which are themselves attracted by Japanese competence in fermentation and enzymatic engineering.

With an influx of private capital, an expanded research effort, and access to a new technology, Japan cannot but strengthen its position, which already ranks second in the world.

In the land of the rising sun it is the agro-food firms which are setting the pace. Possessing a historic know-how based on traditional fermentation techniques for sake, they have used it as a weapon with which to penetrate new markets.

The path was opened after World War II by Meiji Seika (soft drinks, chocolate, and preserves), which began antibiotics production. With 5,700 employees and a 1982 turnover of 185 billion yen, the twin bases of Meiji Seika's activities are antibiotics, which account for 40 percent of the turnover, and food products.

"The industrial strategy of Japanese firms in the agro-foodstuffs sector is particularly interesting. While the pharmaceutical groups tend to stay within their field, those in the agro-foodstuffs of course try to develop research programs adapted to their activity, but almost all of them practice in addition some diversification into a closely related field. So they approach such sectors as pharmaceuticals, medical engineering, enzymes, and bïoreactors," as is emphasized with supporting examples by Jean Bebin, scientific adviser fo the Lyonnaise des Eaux group, which sent several missions to Japan. The activities of the firms concerned are quite varied and include the traditional fermentation industry (Ajinomoto, Kyowa Hakko); the fermented beverage industry (Suntory, Tokyo Jozo); dairy industries (Meiji Milk, Morinaga Milk); and starch production (Japan Maize).

A survey of more than 200 Japanese firms shows, moreover, that 91 percent of the agro-foodstuffs firms questioned have a biotechnological research program in progress. In chemistry the figure is 79 percent, and in pharmaceuticals 77 percent.

In the gigantic struggle in which it is engaged, France must also reckon with enterprises of other European countries, which have vigorously taken up this new industry.

In Denmark, for example, the Novo firm alone controls nearly half the world market for industrial enzymes, estimated at $350 million, and ranks second in insulin production. The Novo group employs nearly 4,000 people, of whom 3,200 are in Denmark. Its turnover, of which 98 percent is from foreign sales, has practically tripled in 3 years to reach 2.7 billion Danish kroner.

The great ambition of Mads Ovlisen, 42, president of the bold Danish firm, is to win its share of the world insulin market now dominated by the American pharmaceutical giant Ely Lilly. To accomplish that he is banking on human insulin obtained by enzymatic engineering. Concurrently, the Danish firm is pursuing its penetration of the huge fermentation market represented by Japan. Thus Novo Biochemical Industry Japan has acquired land on the large island of Hokkaido on which to build an enzyme production plant.

Faced by the "small" Danish multinational, another European firm, Gist Brocades of the Netherlands, which employs 6,000 people and had a 1982 turnover of 1.5 billion florins, and which is one of the world's major producers of industrial and pharmaceutical fermentation products, is now investing in biotechnology, with the help of Dutch financiers and the public authorities of the Netherlands.

It controls 30 percent of the world enzyme market, but also produces antibiotics, yeasts and bakery products, alcohol and molasses. Gist Brocades, which in France controls the firm Rapidase, last year acquired a new president, Gijs Bresser, 47. This specialist in organization and data processing came to Gist Brocades in Utrecht 10 years ago, and views today's battle in these terms: "Biotechnology is not for small enterprises; it requires considerable research potential and a great deal of money for investment; for in this field, if one wants to industrialize, it must be done on a large scale."

Ambitious Plans of ICI and Ciba-Geigy

John Harvey-Johns, head of Imperial Chemical Industries (ICI), would hardly deny Gijs Bresser's words. When the number one of British chemistry--with 123,000 employees and a turnover of 7.4 billion pounds--decided to enter industrial production of unicellular organic proteins (UOP), it straightaway built the world's largest fermentor with a capacity of 1,300 cubic meters, at a cost of 40 million pounds. Located in Billingham and started up in 1980, the installation has a production capacity of 50,000 tons per year. The end product, called "Pruteen," is intended as animal feed. Compared with soybean oilcake, the major protein source now used in animal feed, Pruteen is not yet competitive in price.

ICI's whole wager is to increase the protein content of its product while at the same time substantially lowering its production cost. It expects to reach that goal by combining optimal fermenter operation with strain improvement through genetic manipulations.

At all events, many countries are taking a close interest in the ICI process. More than that, Soviet industry minister Leonid Kostandov, during his December visit to Britain, confirmed the purchase of a UOP production unit. John Brown Engineers, builders of ICI's Billingham plant, will be responsible for completion of the Soviet unit, whose capacity will reportedly reach 100,000 tons per year--a new record.

In another field, ICI has succeeded in creating a biodegradable polymer, PHB, by a bacterial fermentation process. Though volume production has not yet started, PHB is now the only plastic material in the world not derived from petroleum.

Another European chemical firm, Ciba-Geigy of Switzerland, with 70,400 employees and a turnover of Swiss Fr 13.8 billion, leads Europe in agrochemistry and ranks third in pharmaceuticals. It too has an ironclad belief in biotechnology, and has just invested Swiss Fr 42.8 million--French Fr 163 million--in a new research building in Basle. With laboratories, auxiliary installations, test areas, and administrative services, the building will bring together the 155 members of the department of biotechnology, pharmaceutical division, whose research budget is growing by 20 percent yearly.

The world over--in Europe, the United States, and Japan--initiatives are multiplying and projects taking concrete form. In the face of that ferment the attitude of French industry most often seems marked by great caution. "Caution? not exactly," corrects deputy managing director Bertrand Collomb of Lafarge-Coppee, who is also president of the biochemical company created within the group. He prefers to talk of realism. "To bank on a very rapid explosion of the market for biotechnologies would be a mistake," he says.

One thing, at any rate, is clear: relations among the various partners in French bio-industry--researchers, officials, industrialists--have suddenly tensed in recent months. To realize that, it is enough just to hear them talk: "Industrialists and bankers have no confidence in French research. The proof? They prefer to invest in the United States, in 'venture capital' firms," deplores a renowned scientist. "We note a certain fuzziness in the government's action," complains an industrialist.

Another, who is managing director of a study and development consulting firm, goes further in his criticism. "The public authorities are fascinated by genetic engineering, but they underestimate the importance of process and equipment in biotechnology. Yet much could be done in that field." "The spirit of enterprise is withering," adds a banker.

To sum up, everything looks as if everyone were beginning to dissociate himself from any shared responsibility for a possible French defeat in the world battle for biotechnology--and that, no doubt, is what is most alarming.

"OLD" AND "NEW" COMPETITORS

Name	Nationality	Major Activity	Biotechnology
Ajinomoto	Japanese	Agro-food, chemical, pharmacy	First world producer of lysine & monosodium glutamate (amino acids).
Ciba-Geigy	Swiss	Chemical, agro-chemical, pharmacy	Large research program, especially in seed and health fields.
Corning Glass	American	Glass	Enzyme bioreactors on glass slides.
Dow Chemical	American	Chemistry	Enzymes for cheese making.
Du Pont	American	Chemistry (1st rank in world)	Human interferon research program.
ELF-Aquitaine	French	Petroleum	Seeds; research on valorization of whey through biotechnology.
Ely Lilly	American	Pharmacy	A major world producer of antibiotics; considerable fermentation capacity.
Exxon	American	Petroleum (world's largest industrial group)	Research program on application of biotechnology to oil industry (extraction, pollution control) and chemistry.
General Electric	American	Electric & electronics industries	Research on ethanol production & industrial applications of monoclonal antibodies.
Gist Brocades	Dutch	Industrial & pharmaceutical fermentation products	Second ranking world producer of enzymes.
Gulf Oil	American	Petroleum	Ethanol production by cellulose fermentation.
Hoechst	West German	Chemistry, pharmacy (1st rank in world)	A major world producer of antibiotics.
ICI	British	Chemistry, petrochemistry	Production of unicellular organic proteins (UOP); development of a biodegradable polymer.
Kikkoman Shoyu	Japanese	Fermented products (sauces, alcoholic beverages, pharmaceutical enzymes)	Largest Japanese producer of soy sauce (shoyu).
Kyowa Hakko	Japanese	Pharmacy, chemistry, foodstuffs	A major Japanese producer of amino acids.
Lafarge-Coppee	French	Cement	Amino acids (ranking European producer of lysine and sodium glutamate); seeds.

Name	Nationality	Major Activity	Biotechnology
Meiji Milk	Japanese	Agro-food (dairy products)	Research directed toward pharmaceuticals.
Meiji Seika	Japanese	Agro-food, pharmacy	First Japanese producer of antibiotics in bulk.
Mitsubishi Chemical	Jepenese	Chemistry (ranks 1st in Japan)	Its enzyme fixation process accounts for 40% of world SHTF [expansion unknown] production.
Mitsui-Toatsu Chemical	Japanese	Chemistry	Research on urokinase and interferon contracted to Genex and Genentech (USA).
Monsanto	American	Chemistry	Seeds; animal growth hormones; large genetic engineering research program.
Novo Industrie	Danish	Fermentation products; industrials & pharmaceuticals	Ranking world producer of enzymes, with 50% of market.
Rhone-Poulenc	French	Chemistry, pharmacy	World's third largest fermentation capacity; ranking French firm in bio-industry.
Royal Dutch Shell	UK/Dutch	Petroleum	Large research program focused on petroleum recovery, ores processing, chemistry, agriculture.
Roussel-UCLAF (Hoechst group)	French	Pharmacy	Leader in cephalosporine antibiotics.
Sanofi (ELF-Aquitaine gp)	French	Pharmacy	Products of biological origin (serums, vaccines, diagnostic reaction agents) account for 15 percent of turnover.
Sankyo	Japanese	Chemistry, pharmacy	First Japanese producer of vitamins in bulk.
Schering-Plough	American	Pharmacy	Antibiotics; invested $100 million to produce Biogen's Alpha Interferon.
Searle	American	Pharmacy	Production of aspartame, a sweetening product; research on interferon.
Shell Oil	American	Petroleum	Financing ($5 million) of research on interferon conducted by CETUS [expansion unknown].
Suntory	Japanese	Agro-food (alcoholic beverages)	Research on fermentation processes, enzymatic technology, genetic recombining.
Takeda Chemical	Japanese	Pharmacy	Largest Japanese producer of enzyme-based and antibiotic-based medications; second ranking producer of vitamins in bulk.
Unilever	Dutch	Agro-food (first rank in world), chemistry	Focuses large part of its research on biology: working on enzymatic systems, application of monodonal antibodies, cellular cultures, cloning of oil palms on commercial scale.

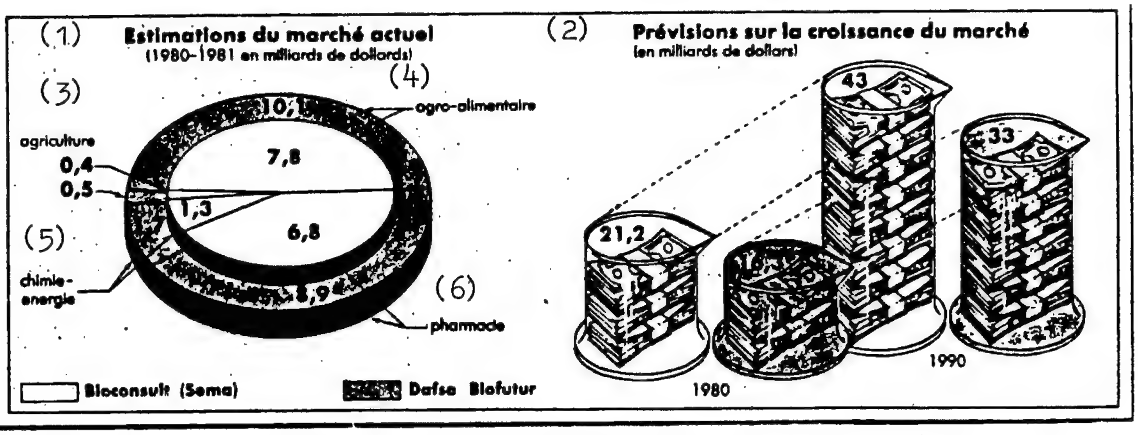

Figure 1. A Market Destined to Double in 10 Years

Key:

1. Estimates of present market (1980-81, in billions of dollars)
2. Market growth forecasts (in billions of dollars)
3. Agriculture
4. Agro-food
5. Chemistry-energy
6. Pharmaceuticals

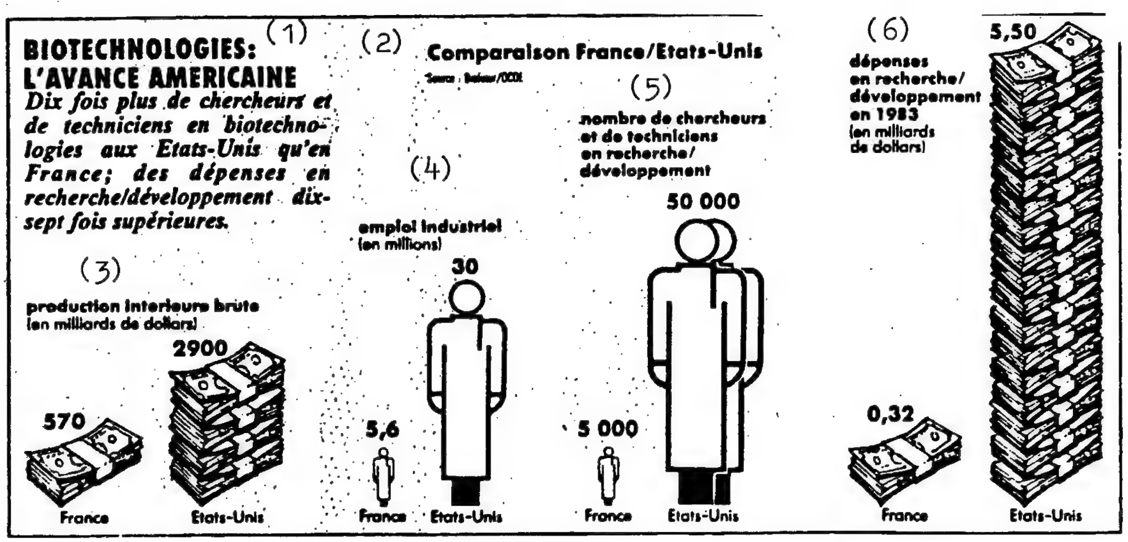

Figure 2. Key:

1. The American lead in biotechnologies: 10 times as many researchers as in France; research and development spending 17 times higher
2. Comparison: France/United States (source: Biofutur/OECD
3. Gross domestic production (in billions of dollars)
4. Industrial employment (in millions)
5. Number of researchers and technicians in research and development
6. Research and development spending, 1983 (in billions of dollars)

PHOTO CAPTIONS

1. p 33. ICI's newly built fermenter at Billingham, England, the world's largest, with 1,300 cubic m of fermentation capacity. The product obtained, named "Pruteen," is intended for use as animal feed.

2. p 34. The Anglo-Dutch group Unilever has succeeded in cloning oil palms on a commercial scale.

3. p 34. Ciba-Geigy has just invested Fr 163 million in Basle on a new biotechnological research facility unique in Europe.

4. p 38. Gijs Bresser, president of Gist-Brocades: "Biotech is not for small firms."

5. p 37. Gist-Brocades research laboratory in Delft. This Dutch firm is one of the world's major producers of industrial and pharmaceutical fermentation products.

6145
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BELGIAN FIRMS JOIN RESOURCES, RESEARCH EMZYMES

Brussels LE SOIR in French 7 Mar 84 p 2

/Article by Jacques Poncin/

/Text/ A research contract entered into force 1 March joining two scientific organizations and three important firms to conduct what is called "protein engineering," which is, in a way, the second generation of genetic engineering--itself the brightest jewel of what is called biotechnology. If this research, which may continue for 5 to 6 years even though the initial contract is limited to 2 years, is successfully concluded, it should place our industry in the very first rank as a producer of so-called "tailor-made" enzymes--choice tools of chemical and agro-food industries.

Those three firms are Solvay, Amylum, and Raffinerie Tirlemontoise, which are joined in the Committee on Biotechnological Studies created in 1982 by the IRSIA (Institute for Scientific Research in Industry and Agriculture), an agency which manages budgeted research funds from both public and private sources. The firms decided with one accord to entrust this spearhead research to two organizations: Plant Genetic Systems, a company which applies the know-how acquired in the laboratories of Professors Schell and Van Montagu at the University of Ghent, and the service directed by Mme Wodak in the department of physical chemistry under Professor Reisse at the ULB /Free University of Belgium/, which is to construct computer models of the molecules to be put to use.

What is it all about? Essentially, the task is to produce custom-made enzymes. Those "little beasties," learnedly made known a few years ago by detergent manufacturers, are in fact very complex biochemical substances of which living organisms make constant use. Our industries have long since learned to use them also, and they are not alone, for housewives--unknowingly, of course--practice biotechnology and make use of the properties of enzymes every time they put yeast in dough.

More than 1,000 "biochemical tools" of this type are indexed, and they can be put to a wide variety of uses. But their users, generally speaking, are not fully satisfied with them, for emzymes were created to act in a living environment, which in general differs greatly from the industrial environment into which they are transposed. That is why industrialists, though still avid for new methods of producing enzymes, would like at the same time to be able to "redesign" those substances so as to make them more active, active at different temperatures, more resistant, and the like.

The researchers will try to achieve such "hand tailoring," and pursuant to this contract they will work on endonuclease, an enzyme which hardly seems to have any industrial use, but which is well known to researchers and constitutes an excellent research model, though it may not become an industrial tool. Simultaneously other researchers, working for one of the three firms--Amylum--will strive to modify glycoserisomerase, an enzyme which might revolutionize the whole starch and sweetening products industry.

6145
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FRENCH CGE PLANNING TO BECOME FACTORY AUTOMATION LEADER

Paris ELECTRONIQUE ACTUALITES in French 17 Feb 84 p 3

[Article: "CGE Ambitions To Become a World Leader in Factory Automation"]

[Text] CGE [General Electricity Company] is eager to become one of the five or six world leaders in factory automation, according to LES ECHOS. To reach its goal, the nationalized group divided its forces into four poles hinged around an engineering center. An overall plan was submitted to the administration, to obtain the funds required to finance the operation.

The mission of the factory-automation engineering group will be to arrive rapidly at a flexible plant, after a flexible production island and a flexible workshop. The industrial control pole, which is headed by CGEE[General Electrical Equipment Company]-Alsthom, already has some experience in the development of software and the manufacturing of equipment for machine and continuous process automation.

Similarly, the computer-aided design pole organized around CGA [General Automation Company] will inherit part of Telephone-Thomson. As for the robotics pole, Alsthom-Atlantique recently created a division employing 1,300 people and whose sales should increase from 250 million francs to 1.5 billion francs within the next five years. SCEMI [expansion unknown], a subsidiary of CEM [Electromechanical Equipment Company] will provide a center of gravity for robot operations; it will be supported by ACB [Brittany Workshops and Yards]. Alliances with European or even Japanese or U.S. partners are probable.

The components pole is not yet well defined. CGE already has some experience in laser machining and artificial intelligence, especially through CILAS [Laser Industrial Company] and the Marcoussis research laboratories.

To fulfill its ambition, CGE will have to invest 400-500 million francs. It is relying on the Industrial Modernization Fund and on industrial policy credits. According to LES ECHOS, the project outline was approved by the administration. The details still have to be worked out.

9294
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MATRA-AUTOMATION PLANS INDUSTRIAL AUTOMATION PRODUCTS

Paris ELECTRONIQUE ACTUALITES in French 17 Feb 84 pp 1,3

[Article by H. Pradenc: "MATRA-Automation To Develop Industrial Automation Key Products"]

[Text] Since 1 January, all MATRA [Mechanics, Aviation and Traction Company] operations having to do with controllers and process control have been gathered within the MATRA-Automation division.

It represents a potential of some 700 people who, in 1983, provided sales of some 445 million francs, and whose task will consist in developing key products, especially in the fields of CAD/CAM [computer-aided design and manufacture], robot control, assembly robots and machining cells. "Our objective is not to do everything, but to position ourselves at points through which industrial automation must go, and to offer a consistent line of products."

In line with the philosophy thus expressed by Mr Pellerin, marketing manager of MATRA-Automation, a company is about to be created: Robotronics will be in charge of the "intelligent" side of the products, its immediate goals being to develop Visiomat and Syscomat. Robotronics, owned 100 percent by MATRA and employing some 30 people, can look forward to a large market.

Visiomat was specially designed for inspection and form recognition, but it can also be associated to a robot, or be used for the surveillance of premises. Three algorithms are now available for Visiomat: contour extraction, image comparison, and morphological transformation. Within two or three years, as many more algorithms become available, an expert system will select one or several of them, depending on the user's needs.

Syscomat Robot Control

The second battle horse of Robotronics is the Syscomat robot control that will be shown at the machine-tool next June in its first version, designed to control a robot with two or three axes or a revolving machine. A second version will replace the expensive computers and software used for machine control. Finally, a third level will provide for the supervision of several machines with an industrial bus. The Robotronics subsidiary will specialize in software development, 90 percent of the equipment manufacturing being subcontracted.

MATRA-Datavision (80 million francs in sales in 1983) will continue to be in charge of CAD/CAM operations; its three-dimensional Euclid system has gone around the world and has now been sold to 150 clients. As is known, negotiations are now under way with Renault, which already owns a CAD tool, Unisurf. The negotiations could lead to the automobile manufacturer's acquiring an interest in MATRA-Datavision. There is some talk of a holding company in which MATRA would have a 65 percent interest. Such an association could promote the development of CAD software packages, for instance for streamlining car bodies or laying out car interiors. Small and medium line assembly robots are manufactured by Sormel, an 83-percent MATRA subsidiary, and ADL [expansion unknown], a 54-percent subsidiary formerly owned by Manurhin; the two companies total sales of 65 million francs. MATRA-Automation will not develop large robots, but will gear itself to the external--French or foreign--market to find the pieces that will complete its product line.

MATRA-Manurhin-Automation, a company created after the breakdown of Manurhin, representing 104 million francs in sales, is providing workshops and machining cells. This company, which is headed by Mr Marcel Mas, director of the MATRA-Automation division, manufactures machine-tools (lathes), sells machining centers under an agreement with the Italian company Olivetti, and manufactures machine-tool numerical controls with up to four axes. This company is also engaged in process control, with the Micon system. This is a U.S. patent which the company has developed for French applications; it makes it possible to regulate eight loops in a continuous or discontinuous process. The latest current development involves batch processing. Process-control operations are expected to achieve sales of 20 million francs in 1984.

One of the nine companies of the MATRA-Automation division, Jaz-Industrie, will contribute its expertise in value analysis and, more generally, in engineering. Interelec is manufacturing optically guided handling carts. Plastrex and Sagita, which were inherited from Manurhin, specialize respectively in wire-spooling machines and folding machines. Finally, MATRA-GCA [expansion unknown] is manufacturing photo-repeaters for electronic circuits. In addition, the MATRA group owns 17 percent of the stock of Midi-Robots, which was created in 1983 by university researchers who made their knowledge of expert systems available to the industry. This company has three goals: to advise small and medium-size firms in the field of robotics, to design strongly innovating products, and to develop specific applications for small and medium-size firms.

Twenty Percent Growth

The sales of MATRA-Automation are expected to amount to 535 million francs in 1984, i.e. a 20 percent improvement over 1983. CAD, vision, robot control, assembly as well as machining cells are subsectors in which growth should exceed 20 percent per year. But, as Mr Pellerin pointed out, the French market will be much harder to penetrate than the U.S. market. As was the case for CAD, for which MATRA-Datavision chose to create foreign subsidiaries, especially in the United States, rather than to wait for a problematic opening of the French market, shall we see MATRA-Automation compete with foreign companies on their own turf before coming back to France with an Anglo-Saxon calling card?

9294
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SWEDEN'S ASEA: BACKGROUND, STRATEGIES, PRESENT DIRECTOR

Stockholm MANEDSJOURNALEN in Swedish Feb 84 pp 76-79, 81

[Report on interview with Percy Barnevik, managing director of the Swedish General Electric Corporation, by Ulf Nilson in Vasteras; date not specified]

[Text] The Swedish General Electric Corporation [ASEA] is the company that coalesced with its country. Under the current management, it is on the way to reaching out over a world that has gone electronic.

A vast wasteland often characterizes conversations between reporters and industrialists, but few people can match Percy Barnevik when it comes to ironlike consistency in turning the interview in the direction he wants it to follow: away from digressions, dead ends, and especially personal matters and relentlessly toward the goal, which is an accurate picture of ASEA and an end to the interview.

As I sat talking with (pardon me, interviewing) Percy Barnevik, he did reveal that one way he manages to spend time with his children is to let them ride along sometimes in the car from Vasteras to Arlanda Airport.

And my question "How do you want us to see ASEA?" brought this answer:

"As accurate a picture as possible."

Here follows an accurate picture of ASEA--although taken with my camera.

The story began 100 years ago. Electric light was conquering the world, and that included dark, out-of-the-way Sweden. Light required wire, power stations, and transformers. The current powered motors, elevators, mining machinery, smelting furnaces, streetcars, and trains, and the Swedish General Electric Corporation was involved in all those areas. The company coalesced with its country and was just about equally self-absorbed. Enticed by a clever local politician named Oscar Fredrik "God the Father" Wijkman, ASEA established itself in Vasteras in 1890, and Vasteras thereby became a world-class city, although without realizing it. Either then or later.

We will summarize a good many decades in the history of the Swedish General Electric Corporation as follows:

ASEA became a company dominated by engineers, and in many ways that was to be expected. Innovations did not spread as quickly then as they do now. In general, it was necessary to invent the same products already invented by others, and in such circumstances, it is the technicians who become king--not the managers or the customers. Firms do have a soul, and ASEA's soul grew to be ponderous, quality-conscious, and more than a little haughty. All of which is reflected in the executive suites at the head office: dark wood paneling, polished conference tables, and a magnificent boardroom with portraits of bygone company presidents looking like dukes or members of the Forsythe family.

Such premises are to be found in only one other place in business Sweden: at the old Private Bank, located at 8 Kungstradsgard Street in Stockholm.

This is not by chance, of course. In all essentials, it is the Wallenbergs--and the men chosen by them--who have left their mark on ASEA. The first of the "great ones" (his statue stands in front of the head office) was J. Sigfrid Edstrom, a man so tough that he even impressed Marcus Wallenberg.

"When Edstrom went and sat down in the chairman's seat--sometimes without being invited--it was not easy to get him out of it," said Marcus Wallenberg on one occasion. Edstrom successfully achieved the feat (perhaps a better word would be "outrage") of building ASEA House as the official residence--a construction job so expensive (in all its ugliness) that Marcus Wallenberg senior asked quietly whether the company could afford it. Edstrom stood his ground.

"Now you can hear the doors banging," says Alde Nilsson, a legendary deputy managing director who came a long way as a specialist in production and ASEA managers and is now retired--but still as active as a whirlwind.

The doors are banging, just as Barnevik has made everyone move full speed ahead in the same way that Edstrom did.

But wasn't ASEA going at top speed in the interval? Sometimes yes, sometimes no. The firm grew to become one of the world's 10 largest companies in its field, but it started to stagnate in Curt Nicolin's time.

Nicolin?

Obviously, Nicolin was one of the most brilliant industrialists in the history of Swedish business--everyone says so--but the fact remains: in the 1970's, ASEA began to stagnate.

One insider says: "Calling it a crisis would be an exaggeration, but the trends were there."

Another, highly placed "ASEA man" asserts quite unexpectedly:

"To a tremendous extent, Curt Nicolin was a transient guest in Vasteras.... Barnevik, on the other hand, is already an honorary member of the Rotary Club."

His words about Curt Nicolin being a "transient guest" cannot be taken literally.

Nicolin was managing director from 1961 to 1975 and then chairman of the board. His term of office coincided with the oil crisis, slow economic growth, and declining investments. Products that had once "sold themselves" encountered stiffer competition. For a period of 10 years, volume remained unchanged and the stock price stayed weak. Stock exchange commentators had trouble stifling their yawns.

One of them says: "You cannot say that there was mismanagement, but it all depends, of course, on what you are comparing it with. In markets characterized by stagnation or a decline, it is not enough just to go on as before. You must attack."

It was in that spirit that Percy Barnevik was recruited despite his somewhat unusual name and even though he sports a beard (don't think that such details make things easy in a country where all managers have tried for decades to look like Marcus Wallenberg).

Saying that the choice was a success would be saying too little. The truth is that no newly appointed head of a large Swedish firm has ever chalked up such quick successes. Barnevik, who was appointed in 1979 at the age of 38, attacked ASEA like a one-man liberation front, established an endless series of 14- to 16-hour working days, and seems to have his finger in everything. There is a chance that all of that is regarded as trying by his closest associates.

"I have just worked 6 years out of 3, and that's enough," says Torsten Henriksson, who recently resigned as head of the information department.

The first thing liberated by Barnevik was turnover and profits. The series of figures below have every chance of becoming a classic:

(Millions of kronor)	1980	1981	1982	1983
Turnover	12,557	19,366	25,781	30,000
Profit	382	643	1,304	2,000

(Source: AFFARSVARLDEN; 1983 figures are forecasts)

Money-losing operations were chopped off--Barnevik is an economist, not an engineer, and he is unsentimental and profit oriented. Four thousand jobs have disappeared, but new ones are taking their place at a very rapid rate, especially in robot production, an area in which ASEA is challenging the Japanese--even on their home ground.

It is not true, Barnevik himself emphasizes, that the reorganization involved a big massacre of managers:

"Three out of four deputy managing directors still have their jobs. And 13 of the 14 division managers were in-house appointments."

We asked: "The reorganization was carried out with formidable speed--it was as brutal as a cultural revolution. Was that haste necessary?"

"Yes. When people know that changes are coming, they easily become paralyzed with waiting. Reorganization has to be carried out quickly to restore the peace of mind essential for work as rapidly as possible."

So it was not massacre, but liberation. Especially in two respects:

First, responsibility for results was moved to lower levels in the organization. Barnevik determines policy, but division managers and the managers of subsidiaries have considerable independence--as long as they bring in orders and money.

Second, Barnevik opened up ASEA to the customer--and therefore to the world. Foreign sales in 1979 accounted for 50 percent of production. Now they account for 70 percent, and in a few years the figure will be 85 percent.

The result is that the firm is being bombarded in earnest by stimuli from outside, and Vasteras is finally becoming a world-class city--so much so that the realization is being forced on people that the inhabitants of a country dependent on ASEA, Volvo, Ericsson, and so on live as well on the world market as people do in Sweden, regardless of what tune the politicians are playing. ASEA is still a world leader in power transmission, is expanding in electronics and robots, and is growing fast in the United States (where there are dollars) and Japan (which must always be kept under control). ASEA is selling turnkey plants to developing countries, looking for companies to buy, and believes--in Barnevik's case--that the "cultural revolution" is going to bring in more profits:

"The changes have affected many thousands of people, and presumably it will take years before they are totally accepted."

We asked: "Have your own ambitions played any part in that connection?"

"It would be wrong to deny it."

For once, the answer was left hanging in the air without being clarified. At the time of the interview, Barnevik had just been named chairman of the board of his old firm, Sandvik: a gigantic job on top of a gigantic job that is nowhere near completion. So there is only one correct ending to this article: "to be continued."

What Is ASEA?

ASEA is Sweden's third-largest firm. It has 56,000 employees, 37,000 of them in Sweden, and manufactures about 40,000 different products. Its main activities are:

Power generation: This includes hydroelectric plants, ASEA-Atom, heat pumps (Stal Laval), and so on. This activity accounts for about one-tenth of the total turnover of approximately 30,000 kronor.

Power transmission: Here the most important products are transmission and distribution facilities.

Transportation equipment, especially railroad cars and rapid transit vehicles.

Industrial equipment: This fast-growing activity includes robots.

The Swedish Fan Factory was bought in 1981 Activities include inside and outside environmental control, ventilation, air conditioning, and heat recovery.

ASEA owns about 2 billion kronor worth of exchange-listed stocks. Its most important holding: 49 percent of the voting rights in Electrolux.

Who Is Percy Barnevik?

He was born in Simrishamn in 1941, grew up in Uddevalla in Schartau-permeated Bohuslan Province, and for a long time was constantly being mistaken for Bosse Barnevik--the chief advantage being that it was easier for him to get a taxi.

He says: "There are no other similarities."

He studied at the Goteborg School of Economics and became an economist in 1964. In the same year, he became a consultant in Molnlycke. With a research grant, he spent a year at Stanford University in California, then marched on to the Johnson Group and wound up at the Sandvik Steel Works in 1969.

It was as a "steel man"--in both senses, according to a current joke--that he began to make a name for himself in the inner circles surrounding Marcus Wallenberg. "M.W." was constantly on the lookout for tough, rational, and unsentimental talent, and in Barnevik he found it. As head of Sandvik in the United States for 4 years, Barnevik improved operating results considerably--turnover rose to 1 billion kronor--and introduced a number of new products. His organizing ability and talent for instilling enthusiasm in his fellow workers proved to be so remarkable that even his competition within the firm expressed--reluctantly--its admiration. When he was brought back to Sweden in 1978 to be deputy managing director, it was considered obvious that he would eventually head up Sandvik. And so he has--although he "leapfrogged" the post of managing director and jumped right into the job of chairman of the board--after first heading up ASEA for 4 years.

Barnevik and his wife Aina, 43, who is a teacher, went to school together in Uddevalla. They have three children: Martina, Petter, and Jens.

11798
CSO: 3698/333

SWEDISH FIRM TO MAKE OWN GALLIUM-ARSENIDE-TYPE COMPONENTS

Stockholm NY TEKNIK in Swedish 19 Jan 84 p 25

[Article by Ulla Karlsson]

[Text] Sweden will be the first in Scandinavia to try to "tame" lithium niobate and indium phosphide, the new semiconductor materials. Rifa, the Nordic region's largest semiconductor firm, is the company that will manufacture components of those materials--components which, among other things, will be part of the JAS aircraft.

Manufacturing components and circuits of the semiconductor material silicon is something researchers have been doing for over 25 years. It is a well-established technology that has been improved with every passing year.

But silicon is not the best material for all types of components. There are materials which in some cases have considerably better properties than silicon. One example is the group of semiconductors that often go under the collective name of gallium arsenide (GaAs). Lithium niobate and indium phosphide belong to that group.

Those materials, for example, are very good at transmitting and receiving light. Since electrons can travel up to five times faster in them than in silicon, they are classes as high-speed materials.

Both of those qualities are coveted in telecommunications systems. The ability to transmit and receive light is used, for example, in fiberoptic systems, in which the electrical signals must be converted into light before they can be transmitted (and vice versa). It is fiberoptic systems which will eventually replace our "old" telecommunications network.

Speed in the materials also makes them well suited for switches. And fast switches are needed in all telephone exchanges and central telephone offices.

But manufacturing components of lithium niobate and indium phosphide is a new technology and one that is not established in the same way that manufacturing with silicon is. This has made it difficult to buy components of that kind. And when they can be bought, delivery times are often very long.

That is why the management of the Ericsson Group has now decided to acquire the know-how needed for manufacturing the components it wants (Rifa being a wholly owned subsidiary of Ericsson). In 1984 and 1985, therefore, Rifa will invest about 30 million kronor in new equipment, after which another couple of years will be needed for development before production of the first components can begin. Those components will include switches of lithium niobate--switches that will take care of internal communications in the JAS aircraft.

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MATRA HARRIS SEMICONDUCTORS IN FRANCE PLANS NEW PRODUCTS

Paris ELECTRONIQUE ACTUALITES in French 24 Feb 84 pp 1, 15

[For related article see JPRS-WST-84-001 of this series dated 4 Jan 84 pp 38-42].

[Text] In his press conference of 15 Feb last Mr Lagardere, MATRA President, announced that HMS (Matra Harris Semiconductors) was to see its capital increased by FF 400 million, with one-half being provided by Harris, and the other half by Matra.

This amount of money will be used partly to cover the MHS losses, which have risen to about FF 150 million in 1983 and, partly (about two-thirds) to finance investments intended to enable the company to double its production capacity by the end of 1984, and prepare the plants to produce circuits in true 2 micron technology before the end of the year, followed by circuits in 1.6 micron technology in 1985.

Not counting government assistance and development contracts granted by government agencies, the MHS revenue amounted to FF 144 million in 1983, 55 percent of which were provided by the production from the Nantes facility, an amount which is very close to that anticipated at the time of the last Components Show (see ELECTRONIQUE ACTUALITES, Nov 83).

The planned investments will contribute to a potential increase in revenue of 130 percent in 1984, this increase being limited only by the production capability rather than by the market demand, which is currently markedly larger than the supply.

Through this decision to increase capital, the MHS stockholders are reaffirming their determination to follow the chosen direction, even if the profitability breakeven year is delayed 2 years from the initial planning (1985 instead of 1983). As we had announced in our issue of November, MHS is not expected to experience losses after the last quarter of 1984, with the total losses for that year anticipated to amount to FF 70 million (all losses referred to in this article take into account compensation due to government assistance, whereas revenue figures do not include contracts from government agencies).

The investments to be made in 1984 will not involve new construction, but rather an increase in equipment inventory which will not only result in the increase in production mentioned above, with current technologies but will also, through compatibility of the equipment with 2 micron technology allow a progressive phase-over to new technologies. Such will be the case, in particular, for light detectors. Since a whole area of the production facility will be converted to class 10, this will result not only in an increase in production efficiency, but will also allow production of circuits in 1.6 micron technology in 1985.

The same installations are currently being used by MHS to produce NMOS and CMOS circuits. The most advanced products are NMOS technology HMOS I/II and SAJI IV reduced to C-MOS. The switch to true 2 micron technology at the end of 84 will permit the use of Harris' SAJI V technology, and Intel's advanced HMOS II technology. But preparations are already underway for the production of 1.6 micron SAJI VI/HMOS III technologies in 1985: a part of the MHS investments will be used this year to reinforce the capabilities of their pilot line to test new technologies.

The biggest investment step, however, will be taken next year: in order to be considered among the best technologically, HMS must make the decision, in early 1985, to build a new facility to house its ultra-modern production lines. This means a new investment on the order of FF 350 million. MHS would thus find itself again, in early 1986, among the most innovative world leaders with a 1.2 micron technology.

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ITALY'S SGS INVESTS TO MODERNIZE RENNES PLANT IN FRANCE

Paris ELECTRONIQUE ACTUALITES in French 24 Feb 84 pp 1, 14

[Text] SGS (Societe Generale des Semi-conducteurs) has just started to build, in its Rennes facility, a production module for linear integrated circuits on 5-inch wafers, with a capacity of 15,000 wafers per month, as well as a design center and a social center.

Work should also start in 1985,for the construction of a facility for the production of 5-inch power semiconductors with a production capacity dependent upon the evolution of the market, but which should amount to about 15,000 wafers/month. Thus, SGS is preparing to invest FF 250 to 300 million over the 1984-1986 period.

Production start-up is expected for July of this year in the case of the new linear module, and in 1986 in the case of the power transistors. The design center construction should start any day, with occupation beginning in September.

Restarting

The Rennes facility, built about 20 years ago, saw its best days in the 1969-1970 period, with a population of almost 600 employees. But the evolution of technologies, under-investment for a period of about 12 years, together with salary competition from the Far East have placed it in a critical situation with respect to world competition. Today, the Rennes plant employs 420 persons and contributes 50 percent of the revenue of the French affiliate (FF 235 million in 1983). Its activity is dedicated to the production of various 3-inch bipolar circuit wafers, module assemblies, and high reliability products, particularly for space applications.

In 1982, SGS presented to the government a proposal for a plan for the development of the Rennes plant, a plan which required government assistance in a number of areas in order to be implemented. The plan was accepted last June, at which time our publication announced that a level of priority was given to linear IC's within the framework of the government's micro-electronics plan (see ELECTRONIQUE ACTUALITES of 10 June 83).

SGS is thus to receive a large, undisclosed sum of money, (FF million 80 between now and 1986 according to a non official source) and to which should

be added various general or local aids (DATAR [Agency for the Development of the Territory and for Regional Action;], job creation) and specific telecommunications and industrial grants, particularly within the scope of development contracts. However, the majority of what is termed "aid" consists in fact of interest-carrying loans.

This aid alone does not justify a build-up of the Rennes facility. SGS believed that the presence of a design center on French soil was indispensable in order to increase its share of the market in France. By the same token, the production in France of some specific circuits, including the famous SLIC (Subscriber Line Interface Circuit), is a necessary condition for its unrestricted acceptance in French state-of-the-art equipment currently being developed, particularly in the telephone and automobile industries. High voltage linear circuits will thus be one of the main specialities at Rennes. But production equipment must be modern in order to be competitive, which explains the investments described.

Within the scope of the plant modernization program, it is also planned that production lines will be automated in order to arrive at competitive costs.

SGS is hoping that the Rennes production will enable them to turn a profit from the import-export business of the French affiliate within three years, with the plant exporting, as today, 70 percent of its production.

Let us note that Rennes will operate as second source for Agrate, Italy, for linear circuits and, in 1986, as a second source for Catania for power products.

Applied Research

The design center whose opening is planned for next September is called an applied research center by SGS: the plan is not only to design custom circuits but also to develop, together with government agencies, universities, and local engineering schools, products that can be marketed.

SGS seems to have the same difficulties as its competitors installed in France, to get the government to agree to shift-work. In the official communique announcing the modernization plan for the Rennes plant, the French management of the company deplored the lack of qualified professionals in our country in the microelectronics area and pointed out: "It is necessary to be able to operate expensive equipment whose life span is often short, on a 24-hour a day basis, 365 days a year. In our mind, it is the indispensable condition to be able to offer attractive prices, in a pitilessly competitive world environment, and also maintain employment in our country."

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BRIEFS

SIEMENS INVESTS IN MICRONICS IC's--In 1984, Siemens is to invest DM 400 million (FF 1,200 million) in the area of micron and submicron IC's. Of this amount, FF 600 million is tagged for the study of submicron technologies in their Munich-Pellach center, and FF 600 million is for the construction of a new production unit at Regensburg, not far from Munich, which will be exclusively dedicated to technologies under 1.5 micron. Siemens is already planning the production of 1 Megabit RAM's at Regensburg in 1986. With this amount of investments, it it certain that Siemens/Semiconductors will be in a position to face Japanese competition on an equal footing We do not know to what extent the German government is participating in this operation. Let us point out that Siemens had already invested FF 300 million in 1983 to set up a production line in 1.5 micron technology in Villach, in Austria. [Text] [Paris ELECTRONIQUE ACTUALITES in French 24 Feb 84 p 14] 6445

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FINLAND DEBATES LAW TO PERMIT INCREASED FOREIGN INVESTMENT

Helsinki FORUM FOR EKONOMI OCH TEKNIK in Swedish 14 Mar 84 pp 12-13

[Article by Matts Dumell]

[Text] The idea is that corporations would be allowed to sell more shares to foreigners without thereby becoming what are called "risky firms."

Foreigners are currently allowed to own not more than 20 percent of the shares in Finnish firms. If that limit is exceeded, the firm's right to acquire property or shares is restricted.

Attempts to increase that limit from 20 to 40 percent have been underway for a long time.

Actually, the matter falls within the province of the Ministry of Trade and Industry, but the government felt that a legislative bill should be drawn up by the Ministry of Justice. That bill was completed at the end of last year.

Government Approval

The work was headed by Leif Sevon with Christoffer Maxell's help. Reportedly, one reason why the job was given to the Ministry of Justice was that as a Social Democrat, Seppo Lindblom did not want to be associated too obviously with its content.

While he personally supports increased stock ownership by foreigners, there is opposition from powerful forces in the Social Democratic Party's leftwing and the labor union movement.

According to the law-drafting committee in the Ministry of Justice, foreigners would be allowed to own 40 percent of a Finnish firm's capital stock only with cabinet approval.

The government would also decide in each individual case whether it would be appropriate for that particular firm to broaden its ownership base abroad.

Control by Bank of Finland

As an additional safeguard, it is being proposed that the Bank of Finland also give its approval.

If the Bank of Finland disagreed with the government and interposed its veto, the result in practice would be to ban the increase in foreign ownership.

As a further safeguard for preventing foreigners from unofficially increasing their influence in a firm's decisionmaking bodies, the Ministry of Justice wants to retain the provision that the total number of votes controlled by foreigners may not exceed 20 percent of the voting rights in a firm.

With majority approval, foreign-owned shares could constitute a maximum of one-fourth of the current shares.

What Really Happened?

The proposal by the Ministry of Justice reportedly formed the original basis for the government's intended bill on this issue. The proposal was worked out in detail, with new sections of the law already written for quick approval by Parliament. But for some reason, Lindblom seems to have gotten a bad case of the shakes. He has not brought up the issue with the government.

Neither has the Foreign Investment Board taken a stand on the bill. Or, to put it more accurately, no one has asked it to, even though it is the only official advisory body in such matters.

Two representatives of the leftwing have already resigned in protest against the fact that the bill has not been thoroughly dealt with by the board.

Fear of Split

Unofficial reports and rumors from the Social Democratic camp say there is a concern that the party might split if the ceiling on foreign ownership is raised from 20 to 40 percent.

There has been campaigning within the union for some time now to see that at least the bill is not passed with Social Democratic votes. The Communists have consistently linked the bill with the notorious EEC laws. They have scored points at Social Democratic expense on this issue.

On the extreme left, there is also talk of the possibility that conservative business circles will not easily accept the idea of selling shares in Finnish firms abroad.

The idea is to try to turn the conservative bourgeoisie against the modern managers of exchange-listed firms.

From 10 to 20 Exchange-Listed Companies

Actually, the entire issue is more a matter of principle than of practice.

Foreign ownership of shares is hardly likely to interest any of our firms except the largest exchange-listed companies, and even among the latter, only those seeking greater internationalization would be involved. In today's situation, few firms have a shortage of unrestricted shares.

Those certainly interested are such firms as Wartsila, Nokia, Instrumentarium, Kone, Huhtamaki, Amer, Finnish Sugar, and perhaps Marimekko.

Possibly More in Time

The chief motivation for increasing the ceiling on foreign stock ownership is that "the relatively weak financial structure of Finnish firms constitutes a considerable obstacle to their ability to take risks and to the revival of their activities."

The proposal has also been justified on the grounds that it would increase the financial flexibility of the firms to some extent and that it would help in attempts to improve their capital structure.

One Thousand Risky Firms in Finland

As of the end of last year, there were 1,036 so-called risky firms in Finland, meaning those in which direct foreign ownership of capital stock exceeded 20 percent.

One-fifth of those, or 207, were manufacturing firms.

Last year, foreign firms established or bought into 68 subsidiaries and partnerships and relinquished joint ownership in 19 firms.

At the end of 1983, there were 200 more Finnish firms abroad than there were foreign firms in Finland.

In an unofficial memorandum, the Foreign Investment Board notes that the proposals for more lenient rules concerning stock ownership by foreigners would not have any major consequences as far as the national economy is concerned.

The legislative changes would benefit primarily Finnish firms that want to obtain capital abroad by going international.

Another point emphasized is that all applications for increased foreign ownership of shares would be handled by the board's general committee. Represented on that committee are the Ministries of Trade and Industry, Interior, Labor, Foreign Affairs, and Finance and the Bank of Finland.

The memorandum also states that foreign ownership of shares reduces foreign-exchange risks. If the equivalent capital were borrowed abroad, interest rates

Table 1: Ten Largest Firms in Foreign Hands in Finland in 1982

Firm	Turnover in millions of marks	Exports in millions of marks	Number of employees
Shell	2,750	95	810
Teboil	2,470	80	590
Esso	2,270	1	610
Scan-Auto	1,490	1	1,510
Volvo-Auto	980	-	730
Finnish Petroleum	980	58	160
Ford	810	-	190
Saab-Valmet	810	460	1,460
Finnish General Motors	550	-	60
Electrolux	550	59	1,500

Source: TALOUSELAMA No 19, 1983

Table 2: Largest Finnish Firms Abroad in 1982

Firm	Turnover in billions of marks		Exports in billions of marks	Employees	
	Group	Abroad		Group	Abroad
Kone	3.2	1.9	1.0	13,000	7,300
Nokia	6.4	1.7	2.2	24,000	4,300
Kymi	4.4	1.6	1.8	16,000	2,100
Enso	5.5	0.9	3.4	16,400	1,350
Ahlstrom	3.9	0.8	1.8	13,300	1,800
Wartsila	3.9	0.7	2.5	16,900	1,600
Valmet	4.6	0.7	2.0	15,900	1,900
Rauma-Repola	5.9	0.7	3.6	19,600	1,400
Partek	1.9	0.4	0.2	6,100	560
Serlachius	2.3	0.2	1.4	6,800	450

Source: TALOUSELAMA No 19, 1983; TTT No 1, 1984

and foreign-exchange risks would burden the companies in a more unfavorable way.

An idea has been formed of the amount of money that would be obtained by increasing the foreign ownership of shares.

The starting point is that the combined market value of Finnish exchange-listed firms is approximately 21 billion marks. On the other hand, perhaps between 10 and 20 of those firms are interested in increasing foreign ownership of their shares.

The lower limit is set at 150 million marks--that is, the amount obtained by the three firms that were introduced on the Stockholm Stock Exchange last year.

The board says in its unofficial memorandum that relatively speaking, foreign financing in the form of stock ownership would also amount to less than foreign borrowing in the long run. Last year, for example, foreign borrowing totaled just over 4 billion marks.

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NEW RENAULT-MOSKVITCH COOPERATION AGREEMENT EXAMINED

Paris REVOLUTION in French 27 Jan 84 p 13

[Article by Jacques Cramaix: "Renault-Moskvitch Cooperation"]

> [Text] There is a potential for cooperation with socialist countries: witness the agreement between Renault and the USSR.

At the Renault technical center in Rueil, the Soviet prototype that arrived early in January had been expected with some curiosity. Under the draft agreement, Renault shall "assist Moskvitch in designing and testing a new passenger car made by the Soviets." The model already exists. It is also being used; Mr Hanon, the chief executive officer, has already driven it. It looks like the 1307 Talbot which--according to the Renault management--is a considerable improvement over what the Soviets used to manufacture. The engine is already developed, and it is a good one from the point of view of consumption (5.7 liters at 90 km/h), but Renault will have to contribute its knowhow to improve non-mechanical features (body and streamlining, weight reduction, etc.). Renault is thus reviving a well-established tradition, since it started collaborating with the USSR in 1966. The new Soviet car will be assembled at the AZLK [expansion unknown] factory... which Renault built at the doors of Moscow in 1966, on the same model as its Sandouville factory.

The essential question is what comes after the engineering contract (300 million francs): 1 billion francs in equipment will be necessary to start manufacturing. Will Renault be able to make a bid acceptable to the Soviets? Will this potential order help strengthen the French durable goods manufacturing sector? Or, as was the case with the Kama truck factory in Russia, will Renault be just a subcontractor delivering essentially Japanese, German and U.S. equipment?

Apparently, in spite of the Soviets' interest in continuing their collaboration with the French company, Renault almost refused the contract: some Renault engineers and higher officials feared that the company would not be strong enough--not for political reasons but based on their knowledge of the workloads required and the present condition of the national equipment. On the other hand, the CGT [General Confederation of Labor] fought strenuously,

especially with the Renault board, to revive cooperation with the USSR and in particular to have this contract signed.

One question remains unanswered: will they take this opportunity to hire and train the personnel required to develop productions that could be very useful to our country, either at Renault or in small or medium-size firms. Renault told us they would do everything to supply the equipment required, including securing the help of small or medium-size firms.

This contract could also contribute to the creation of jobs in France, permanent, skilled jobs with a high added value; it would give the company a chance to reduce U.S. superiority, as the U.S. market--the "only solvent market"--tends to become the only market (Renault is losing ground on the French and European markets)... at a time when the United States are about to impose an 80 percent "local content."

Some will say that the automobile industry is no longer generating jobs. The revival of international cooperation in all directions--plus the reconquest of the domestic market--could however reverse that trend and lead in particular to the development of the robotics and machine-tool sectors and related jobs. The Soviet contract could probably generate 1,000 permanent jobs. At Renault, in small and medium-size machine-tool and equipment firms, etc. A collaboration between Renault (Renault-Automation) and Peugeot (Peugeot machine-tool sector, Velizy Citroen center, etc.) is quite desirable and could have an impact on many industries, including steelmaking.

But a strong industrial basis in France is a prerequisite to a good development of exports (collaboration could extend to many other projects: to mention only socialist countries, there is some talk of a modernization of the Skoda factory in Czechoslovakia, and other projects exist in Bulgaria, the German Democratic Republic, Poland, etc., not to mention opportunities existing in developing countries). Otherwise, Renault will be just a re-exporter, as it was when it built the latest Renault plant in Spain; 80 percent of the machine-tools installed were neither French nor Spanish.

Let us also mention two other brief news items: Renault Industrial Vehicles just signed an agreement with Cuba: "resumption of more regular trade relations," involving the delivery of road tractors (51.5 million francs); and Citroen will deliver a series of industrial equipment to the German Democratic Republic (160 million francs). This is just another confirmation that a large potential exists.

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